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FACULTY OF EGINEERING

Digital Image Processing
LECTURE-08

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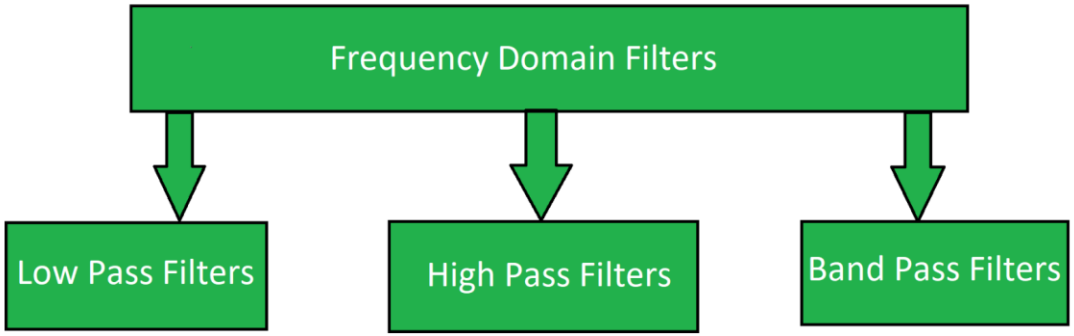
OUTLINE

- Frequency domain analysis
- Difference between spatial domain and frequency domain
- Spatial domain
- Frequency Domain
- Transformation
- Frequency components
- MCQ
- References

Frequency Domain Filters

Frequency Domain Filters are used for smoothing and sharpening of image by removal of high or low frequency components. Sometimes it is possible of removal of very high and very low frequency. Frequency domain filters are different from spatial domain filters as it basically focuses on the frequency of the images. It is basically done for two basic operation i.e., Smoothing and Sharpening.

These are of 3 types:



Classification of Frequency Domain Filters

Low pass filter

Low pass filter:

Low pass filter removes the high frequency components that means it keeps low frequency components. It is used for smoothing the image. It is used to smoothen the image by attenuating high frequency components and preserving low frequency components. Mechanism of low pass filtering in frequency domain is given by:

$$G(u, v) = H(u, v) \cdot F(u, v)$$

where F(u, v) is the Fourier Transform of original image

and H(u, v) is the Fourier Transform of filtering mask

2. High pass filter:

High pass filter removes the low frequency components that means it keeps high frequency components. It is used for sharpening the image. It is used to sharpen the image by attenuating low frequency components and preserving high frequency components.

Mechanism of high pass filtering in frequency domain is given by:

$$H(u, v) = 1 - H'(u, v)$$

where H(u, v) is the Fourier Transform of high pass filtering

and H'(u, v) is the Fourier Transform of low pass filtering

3. Band pass filter:

Band pass filter removes the very low frequency and very high frequency components that means it keeps the moderate range band of frequencies. Band pass filtering is used to enhance edges while reducing the noise at the same time.

MCQ

1. Electromagnetic waves can be visualised as a
   a) sine wave
   b) cosine wave
   c) tangential wave
   d) None of the mentioned

2. How is radiance measured?
   a) lumens
   b) watts
   c) armstrong
   d) hertz

3. Which of the following is used for chest and dental scans?
   a) Hard X-Rays
   b) Soft X-Rays
   c) Radio waves
   d) Infrared Rays

MCQ

4. Which of the following is impractical to measure?

a) Frequency

b) Radiance

c) Luminance

d) Brightness

5. Massless particle containing a certain amount of energy is called

a) Photon

b) Shell

c) Electron

d) None of the mentioned

References

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